In th Claims:

Pl as canc l claims 35 – 39 with ut prejudic or disclaim r.

The following are pending claims 24-55 which were added in the First Preliminary Amendment. Please replace claims 24-28, 34, and 48 with the amended claims 24-28, 34, and 48 shown below:

B1

24. A direct current sum bandgap voltage comparator comprising:

a summing node;

a plurality of current sources connected to the summing node, each current source further comprising at least one transistor, and each current source supplying a current to the summing node and being connected to a power supply voltage, wherein the currents sources supply currents according to a bandgap equation:

$$K_1(V_{CC}-V_T)+K_4V_T=K_2V_{BE}+K_3(kT/q)$$

where $V_{CC}$ is the power supply voltage, $V_T$ is a predetermined threshold voltage of a transistor in a first current source within the plurality of current sources, $V_{BE}$ is a base emitter voltage of a transistor in a second current source within the plurality of current sources, k is Boltzman's constant, T is a temperature in kelvin of a transistor in a third current source within the plurality of current sources, q is an electronic charge constant, and $K_1$, $K_2$, $K_3$, and $K_4$ are constants determined by a resistance and a transistor length in the first, second, and third current sources, respectively; and

an indicator circuit having an input connected to the summing node and generating a logical signal at an output, responsive to voltage changes in the summing node.

25. A direct current sum bandgap voltage comparator comprising:

a summing node;

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a plurality of current sources connected to the summing node, each current source further comprising at least one transistor, and each current source supplying a current to the summing node and being connected to a power supply voltage; and

an indicator circuit having an input connected to the summing node and generating a logical signal at an output, responsive to voltage changes in the summing node, wherein the currents sources supply currents according to a bandgap equation:

$$K_1(V_{CC}-V_T)+K_4V_T=K_2V_{BE}+K_3(kT/q)$$

where $V_{CC}$ is the power supply voltage, $V_T$ is a predetermined threshold voltage of a transistor in a first current source within the plurality of current sources, $V_{BE}$ is a base emitter voltage of a transistor in a second current source within the plurality of current sources, k is Boltzman's constant, T is a temperature in kelvin of a transistor in a third current source within the plurality of current sources, q is an electronic charge constant, and $K_1$, $K_2$, $K_3$, and $K_4$ are constants determined by a resistance and a transistor length in the first, second, and third current sources, respectively, and wherein the plurality of current sources comprises four current mirrors.

26. A zero power circuit comprising:

a first circuit;

a direct current sum bandgap voltage comparator comprising:

a summing node;

a plurality of current sources connected to the summing node, each current source further comprising at least one transistor, and each current source supplying a current to the summing node and being connected to a power supply voltage, wherein the current sources supply according to a bandgap equation:

$$K_1(V_{CC}-V_T)+K_4V_T=K_2V_{BE}+K_3(kT/q)$$

where $V_{CC}$ is the power supply voltage, $V_T$ is a predetermined threshold voltage of a transistor in a first current source within the plurality of current sources, $V_{BE}$ is a base emitter voltage of a transistor in a second current source within the plurality of current sources

sources; k is Boltzman's constant, T is a temperature in kelvin of a transistor in a third current source within the plurality of current sources, q is an electronic charge constant, and $K_1$, $K_2$, $K_3$, and $K_4$ are constants determined by a resistance and a transistor length in the first, second, and third current sources, respectively;

cont B1

an indicator circuit having an input connected to the summing node and generating a logical signal at an output, responsive to changes in a summing node; and

a switching circuit for providing power to the first circuit from a primary power supply and a secondary power supply, the switching circuit being connected to the output of the indicator circuit, wherein power from the primary power supply is supplied to the first circuit of the logical signal indicates that the power supply voltage is equal to or greater than the predetermined threshold voltage and power from the secondary power supply is supplied to the first circuit if the power supply voltage is less than the predetermined threshold voltage.

27. A zero power circuit comprising:

a first circuit;

a direct current sum bandgap voltage comparator comprising:

a summing node;

a plurality of current sources connected to the summing node, each current source further comprising at least one transistor, and each current source supplying a current to the summing node and being connected to a power supply voltage;

an indicator circuit having an input connected to the summing node and generating a logical signal at an output, responsive to changes in the summing node; and

a switching circuit for providing power to the first circuit from a primary power supply and a secondary power supply, the switching circuit being connected to the output of the indicator circuit, wherein power from the primary power supply is supplied to the first circuit if the logical signal indicates that the power supply voltage is equal to or greater than the preselected voltage and power from the secondary power supply is supplied to the first circuit if the power supply voltage is less than the preselected voltage, wherein the current sources supply according to a bandgap equation:

$$K_1(V_{CC}-V_T)+K_4V_T=K_2V_{BE}+K_3(kT/q)$$

Cont B1

where $V_{CC}$ is the power supply voltage, $V_T$ is a predetermined threshold voltage of a transistor in a first current source within the plurality of current sources, $V_{BE}$ is a base emitter voltage of a transistor in a second current source within the plurality of current sources, k is Boltzman's constant, T is a temperature in kelvin of a transistor in a third current source within the plurality of current sources, q is an electronic charge constant, and $K_1$, $K_2$, $K_3$, and $K_4$ are constants determined by a resistance and a transistor size in the first, second, and third current sources, respectively, and wherein the plurality of current sources comprising four current mirrors.

Sub C1

28. A method, comprising:

generating a first current that changes with temperature according to a first polarity;

generating a second current that changes with temperature according to a second polarity;

combining the first and second currents to generate a reference current; and

comparing the reference current to a third current that is related to a power-supply voltage.

29. The method of claim 28 wherein:

the first current changes with temperature according to a positive polarity; and

the second current changes with temperature according to a negative polarity.

30. The method of claim 28 wherein:

the first current is proportional to temperature; and

the second current is inversely proportional to temperature

31. The method of claim 28 wherein:

the first current increases as temperature increases and decreases as temperature decreases; and

the second current decreases as temperature increases and increases as temperature decreases.

32. The method of claim 28 wherein combining the first and second currents comprises summing the first and second currents.

33. The method of claim 28 wherein combining the first and second currents comprises sinking the first and second currents from a node.

B2 Sub E1

34. The method of claim 28 wherein combining the first and second currents comprises sourcing the first and second currents to a node.

40. A method, comprising:

generating a first current that increases as temperature increases and that decreases as temperature decreases;

generating a second current that decreases as temperature increases and that increases as temperature decreases;

generating a third current that is related to a first voltage; and

combining the first, second, and third currents at a node to generate a second voltage on the node.

41. The method of claim 40 wherein combining the currents comprises:

sinking the first and second currents from the node; and

sourcing the third current to the node.

42. The method of claim 40 wherein:

the first current is related to a thermal voltage; and

the second current is related to a voltage across a forward-biased p-n junction.

43. The method of claim 40 wherein:

the first current is related to a thermal voltage; and

the second current is related to a base-emitter voltage of a bipolar transistor.

44. The method of claim 40 wherein the second current is related to the natural logarithm of a current through a bipolar transistor.

45. A method, comprising:

generating a first current that is related to temperature according to a first polarity;

generating a second current that is related to temperature according to a second polarity;

combining the first and second currents into a reference current;

generating a third current; and

comparing the third current to the reference current.

46. The method of claim 45 wherein:

the first current is related to a thermal voltage;

the second current is related to a voltage across a forward-biased p-n junction; and

the third current is related to a power-supply voltage.

47. The method of claim 45 wherein:

combining the first and second currents comprises sinking the first and second currents from a node; and

comparing the third current to the reference current comprises,

sourcing the third current to the node, and

comparing a voltage on the node to a reference voltage.

B3 Sub E1

48. A method, comprising:

generating a first current that is proportional to a threshold voltage of a field-effect transistor;

generating a second current that is proportional to a difference between a supply voltage and a threshold voltage of a second field-effect transistor;

generating a third current that is proportional to a base-emitter voltage of a first bipolar transistor;

generating a fourth current that is proportional to absolute temperature; and

driving a node with the first, second, third, and fourth currents.

49. The method of claim 48 wherein driving the node comprises:

sourcing the first and second currents to the node; and

sinking the third and fourth currents from the node.

50. The method of claim 48, further comprising comparing a voltage on the node with a reference voltage.

51. The method of claim 48 wherein the first field-effect transistor is matched to the second field-effect transistor.

52. The method of claim 48 wherein the threshold voltage of the first field-effect transistor is equal or approximately equal to the threshold voltage of the second field-effect transistor.

53. A method, comprising:

generating a first current that equals a product of a first constant and a threshold voltage of a first field-effect transistor;

generating a second current that equals a product of a second constant and a difference between a supply voltage and a threshold voltage of a second field-effect transistor;

generating a third current that equals a product of a third constant and a base-emitter voltage of a bipolar transistor;

generating a fourth current that equals a product of a fourth constant and a thermal voltage; and

driving a node with the first, second, third, and fourth currents.

54. The method of claim 53 wherein the first constant equals the second constant.

55. The method of claim 53 wherein driving the node comprises:
sourcing the first and second currents to the node; and
sinking the third and fourth currents from the node.

**Please add the following new claims:**

B4 Sub C4

56. The method of claim 28 wherein the third current is proportional to the power-supply voltage.

57. The method of claim 28 wherein comparing the reference current comprises summing the reference current and the third current at a node.

Sub E1

58. The method of claim 28 wherein comparing the reference current comprises:
sinking the reference current from a node; and
sourcing the third current to the node.

59. A method, comprising:
generating a reference current having a first temperature coefficient; and
comparing the reference current to a supply-related current that is related to a power-supply voltage and that has or has approximately the first temperature coefficient.

60. The method of claim 59 wherein the reference current is independent of the power-supply voltage.

61. The method of claim 59 wherein comparing the reference current comprises summing the reference current and the supply-related current at a node to generate a voltage.

Sub D1

Cont B4

62. The method of claim 59, further comprising:

wherein comparing the reference current comprises summing the reference current and the supply-related current at a node to generate a voltage;

connecting the power-supply voltage to a load if the voltage is greater than a predetermined level; and

connecting a secondary supply to the load if the voltage is less than the predetermined level.

Sub E1

63. A method, comprising:

generating a first current that is related to temperature according to a first polarity;

generating a second current that is related to temperature according to a second polarity;

combining the first and second currents into a reference current;

generating a third current that is related to temperature according to the first polarity;

generating a fourth current that is related to a supply voltage and that is related to temperature according to the second polarity;

combining the third and fourth currents into a supply-related current; and

comparing the reference current to the supply-related current.

64. The method of claim 63 wherein the fourth current is proportional to the supply voltage.

65. The method of claim 63 wherein the supply-related current is proportional to the supply voltage.

66. The method of claim 63 wherein:

the first and third currents are inversely proportional to temperature; and

the second and fourth currents are proportional to temperature.